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CLINICAL RESEARCH

Food Intake Visual Scale—A practical tool for assessing the dietary intake of hospitalized patients with decompensated cirrhosis

Camila Saueressig RD, MSc[1] | **Pâmela Kremer Ferreira RD, MSc**[1] | **Joana Hoch Glasenapp RD**[2] | **Valesca Dall'Alba RD, PhD**[1,2,3,4]

[1]Department of Gastroenterology and Hepatology, Faculty of Medicine, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

[2]Department of Food, Nutrition, and Health, Faculty of Medicine, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

[3]Department of Nutrition, Faculty of Medicine, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil

[4]Nutrition Division, Hospital de Clínicas de Porto Alegre, Porto Alegre, Brazil

Correspondence
Camila Saueressig, RD, MSc, Graduate Program in Gastroenterology and Hepatology, Faculty of Medicine, Universidade Federal do Rio Grande do Sul, Rua Ramiro Barcelos, 2400, 2nd floor, Santana, Porto Alegre, RS 90035-003, Brazil.
Email: camilasaueressig@hotmail.com

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Abstract

Background: The aim of this study was whether the Food Intake Visual Scale (FIVS) can be used in clinical practice to measure food intake in patients with decompensated cirrhosis.

Methods: A cross-sectional study was performed with patients with cirrhosis between April 2017 and July 2019. The food intake was assessed through the 1-day diet record (DR) and according to FIVS, which consists of pictures of four plates of food at different levels of consumption: "about all," "half," "a quarter," or "nothing." The analysis of variance test with Bonferroni multiple comparison analysis was used to compare the mean energy intake through the DR according to the FIVS categories.

Results: This study included 94 patients with a mean age of 60.29 ± 9.33 years. Patients with lower food intake according to the FIVS categories also had lower mean energy and macronutrient intake according to the DR: patients eating "about all" ($n = 49$, 52.1%) consumed a mean of 1526.58 ± 428.27 kcal/day, patients eating "half" ($n = 16$, 17%) consumed a mean of 1282.08 ± 302.83 kcal/day, patients eating "a quarter" ($n = 25$, 26.6%) consumed a mean of 978.96 ± 468.81 kcal/day, and patients eating "nothing" ($n = 4$, 4.3%) consumed a mean of 353.59 ± 113.16 kcal/day ($P < .001$).

Conclusion: The results of this study demonstrate that FIVS can be implemented in clinical practice to measure food intake in patients with decompensated cirrhosis as a substitute for the DR because it is a noninvasive, low-cost, quick, reliable, and easy bedside method for obtaining data.

KEYWORDS
cirrhosis, diet records, nutrition assessment, visual scale

INTRODUCTION

Cirrhosis is a chronic liver disease, and your clinical course has been typically described by a compensated and a decompensated state based on the absence or, respectively, the presence of complications such as variceal bleeding, ascites, and hepatic encephalopathy (HE). These marked clinical differences have brought about the concept that compensated and decompensated cirrhosis are two different clinical states of the disease.[1] Malnutrition is common in patients with advanced liver disease, and the prevalence is reported in more than 50% among these patients. The etiology of malnutrition is multifactorial and primarily related to reduced liver function, poor oral intake, and complications of decompensated cirrhosis such as ascites and HE.[2,3]

Most patients with decompensated cirrhosis have inadequate dietary intake, which contributes to overall poor outcomes.[4,5] One of the main reasons for reduced food intake is appetite loss, which is attributed to pro-inflammatory cytokines, early satiety due to decreased gastric expansion capacity secondary to ascites, and altered taste perception.[6] Other factors that can also result in decreased food intake include nausea, vomiting, aversion to certain foods, prescription of unpalatable diets, hospitalization with periods of fasting for diagnostic and therapeutic procedures, gastrointestinal pain, diarrhea or constipation, and HE.[7,8]

Dietary therapy is an essential part of the multidisciplinary treatment for cirrhosis.[9] Treatment goals with dietary intervention revolve around minimizing and correcting malnutrition, preventing progression to liver failure, and managing complications arising from the disease.[10] However, food intake assessment and dietary management are often neglected step in patients with cirrhosis.[11] Assessment of dietary intake in hospitalized patients is complex, and there is still an open debate on which tool can be considered the most accurate due to the limitations related to misreporting, reproducibility, and the availability of resources.[11,12]

Obtaining data about patient food intake can contribute to all stages of nutrition care, from admission to hospital discharge.[13] Furthermore, barriers to adequate food intake are also important to identify and address. However, obtaining accurate information about patient food intake is a difficult and resource-intensive task. A simple, easy to use, quick, and reliable tool for screening and monitoring food intake and barriers to eating in hospital settings would seem essential in daily clinical practice.

Therefore, this study aimed to evaluate the food intake through the 1-day diet record (DR) and according to the Food Intake Visual Scale (FIVS), as well the reasons why the patients did not eat their full meal, and whether the FIVS can be used in clinical practice to measure food intake as a substitute for the DR. Furthermore, we evaluated the prescribed nutrition and compared it with the dietary intake of hospitalized patients with decompensated cirrhosis.

METHODS

Study and sample design

This cross-sectional study was performed with patients ≥19 years of age with decompensated cirrhosis (ascites and/or HE, variceal bleeding, spontaneous bacterial peritonitis, hepatorenal syndrome, or Child-Pugh score B or C) who were hospitalized at the Gastroenterology and Hepatology Division in a public hospital. Patients with bowel disease and intestinal malabsorption, human immunodeficiency virus, and degenerative neurological diseases (with psychological and/or cognitive impairment that could compromise participation); patients with enteral and/or parenteral nutrition; and pregnant women were not included. Patients who did not correctly fill out the DR or who were required to fast for some portion of the assessment day were excluded. Data were collected within 72 h of hospital admission between April 2017 and July 2019. All patients hospitalized during this period who met the established eligibility criteria were invited to participate in the study.

Demographic, clinical, and laboratory assessment

Demographic, clinical data, and biochemical markers (serum albumin, serum creatinine, serum urea, serum sodium, serum potassium, total bilirubin, international normalized ratio, alanine aminotransferase, aspartate aminotransferase, gamma-glutamyl transferase, and alkaline phosphatase) were collected from electronic medical records. The severity of liver disease was assessed by Child-Pugh score[14,15] and Model for End-Stage Liver Disease (MELD) score.[16] The Child-Pugh score has been widely used to assess the severity of liver dysfunction in the clinical setting, whereas the MELD score has been widely used to rank the priority of liver transplantation candidates. Both scores have been widely used to predict the clinical outcomes of patients with cirrhosis.[17] Ascites grade was determined through a physical exam by the physician or through ultrasound and the presence of edema was assessed through a physical exam.

Nutrition and dietary assessment

A trained registered dietitian performed detailed nutrition and dietary assessment that included the following measurements.

Nutrition risk screening

Royal Free Hospital-Nutritional Prioritizing Tool (RFH-NPT)

Nutrition risk was evaluated using the RFH-NPT, a tool for nutrition risk assessment in patients with cirrhosis. First, the presence of acute alcoholic hepatitis or tube feeding is assessed. These conditions automatically classify a patient as high risk. The second step distinguishes the patients with or without ascites or edema. The score is then computed, and the patients are classified into one of the following risk groups: low (0 points), moderate (1 point), or high nutrition risk (2–7 points).[18]

Weight, height, and body mass index

Body weight was measured on a Filizola digital upright scale, a Lider portable electronic scale at the bedside, or an Eleve hoist scale for patients that are unable to stand or patients confined to their beds. Estimated dry body weight (kilograms) was calculated using the current weight minus ascites weight based on severity (mild, 5%; moderate, 10%; severe, 15%). An additional 5% was subtracted if bilateral ankle edema was present.[19] Height was measured with a stadiometer attached to the wall, whereas recumbent height was measured for patients that are unable to stand or patients confined to their beds.[20] Body mass index (BMI) was calculated as estimated dry body weight divided by height squared (kg/m^2), and malnutrition was considered $<18.5\ kg/m^2$ for adults or $<22\ kg/m^2$ for older adults.[21,22]

Subjective global assessment (SGA)

The nutritional status was diagnosed by combining clinical and physical measurements, such as weight changes, dietary intake, gastrointestinal symptoms, functional capacity, and physical exam. The patients were classified as well-nourished (A), moderately or suspected of being malnourished (B), or severely malnourished (C).[23] Individuals classified as B or C were considered malnourished.

Food intake assessment

Requirements

The individual nutrition requirements were determined through the registered dietitian considering 35–40 kcal and 1.2–1.5 g of protein for the actual dry body weight.[24] The patient's nutrition prescription was checked in the electronic medical records for comparison between prescription and dietary intake.

DR

The DR consists of self-recording all food and drinks consumed throughout the evaluated day. Five hospital meals, standardized according to the type of diet prescribed and according to nutrition requirements, were provided: breakfast (8:00 AM), lunch (12:00 PM), afternoon snack (3:30 PM), dinner (6:00 PM), and late evening snack (8:00 PM). In addition to water, other beverages are not provided with main meals (lunch and dinner). A 1-day DR was applied to all participants, who received prior guidance on how to properly report their meals. The registration was done either by the patients themselves whenever possible or by the caregivers depending on the patient's abilities. Subsequently, a trained dietitian checked all recorded information, and the day's consumption was estimated by calculating energy and macronutrient intake through software routinely used in clinical practice by the Institution's Nutrition and Dietetic Department. The software nutritional information is derived from a national food table.[25] Some foods or preparations that were not available in the software were calculated based on the hospital's previously established preparation datasheets. A total of 57 new preparations were calculated and added to the software.

FIVS

The nutrition day (ND) worldwide is a daylong cross-sectional survey performed annually in health care institutions that aim to evaluate the nutrition care processes and nutrition care-related structures, including the food intake at a single meal as an indicator of total daily food intake.[26] In the present study, the FIVS was adapted from the ND questionnaires by a group of professors and dietitians from the Nutrition and Dietetic Department.

The FIVS consists of pictures of four plates of food at different levels of consumption: “about all,” “half,” “a quarter,” or “nothing.” After the patients finished the meal, they were instructed to identify which image on

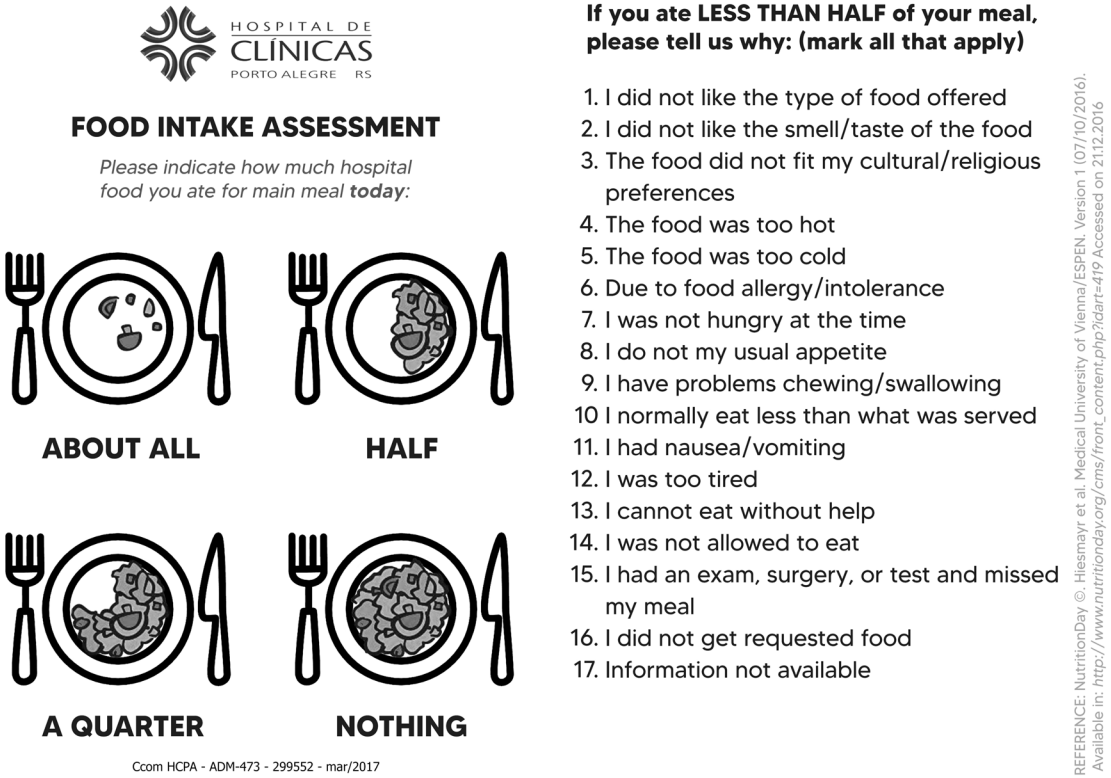

FIGURE 1 The Food Intake Visual Scale to assess food intake of hospitalized patients with decompensated cirrhosis

the tool best represented their food intake. In the present study, lunch was evaluated for practical and logistical reasons. Patients who reported that they ate "a quarter" or "nothing" were further asked to report the reasons for their reduced intake and were presented with a list of 17 possible responses on the reverse of the tool (Figure 1, Figures S1 and S2). Through direct observation of the food plate, the researcher also classified the patient's intake on the FIVS. Interobserver agreement was determined for the researcher and patient classification of food intake. Both dietary intake assessments (DR and FIVS) were performed on the same day.

Statistical analysis

Quantitative variables were described as mean and standard deviation or median and interquartile range (IQR: 25th–75th percentile), while the categorical variables were expressed as absolute frequency (n) and relative frequency (%). The χ^2 or Fisher's exact test was performed to compare proportions. The Kolmogorov–Smirnov test was used to evaluate the normality of continuous variables. Paired Student's t-test or analysis of variance test with Bonferroni multiple comparisons was used to compare variables with a parametric distribution and the Mann–Whitney or Kruskal–Wallis test was used for those with a nonparametric distribution. Pearson's correlation was used to assess lunch calories and total daily calories. Interobserver FIVS agreement was calculated with the Kappa test. The difference between mean energy intake and nutrition prescription was demonstrated with a Bland–Altman plot. $P < 0.05$ was considered statistically significant. The data analysis was performed in SPSS 20.0 (SPSS, Inc.).

Ethical approval

This study was conducted according to the Declaration of Helsinki guidelines and the local ethics committee approved the protocol. All included patients or their responsible caregivers provided written informed consent.

RESULTS

Patient's general characteristics

This study included 106 patients in the sample. However, 12 were excluded due to insufficient dietary data (e.g., not completing the DR and fasting for medical reasons on the day of the evaluation). A total of 94 patients were

TABLE 1 Demographic, clinical, and nutrition characteristics of hospitalized patients with decompensated cirrhosis ($n = 94$)

Variable	*N*
Age, years, mean ± SD	60.29 ± 9.33
Sex	
Male (%)	61 (64.9)
Complications at admission, *n* (%)	
Ascites	68 (72.3)
Mild	25 (36.8)
Moderate	42 (61.7)
Severe	1 (1.5)
Variceal bleeding	24 (25.5)
Hepatic encephalopathy	17 (18.1)
Coexistent HCC, *n* (%)	27 (28.7)
Diabetes, *n* (%)	37 (39.4)
Hypertension, *n* (%)	35 (37.2)
Child-Pugh score, *n* (%)	
A	8 (8.5)
B	57 (60.6)
C	29 (30.9)
MELD score, median (range)	14 (12–18)
ALT, $n = 92$, median (range), U/L	31.5 (20.25–55.5)
AST, $n = 93$, median (range), U/L	53 (36.5–95)
GGT, $n = 80$, median (range), U/L	106 (66.25–206.75)
ALP, $n = 91$, median (range), U/L	127 (84–191)
Serum albumin, g/dl, mean ± SD	3 ± 0.58
Creatinine, mg/dl, median (range)	0.89 (0.71–1.35)
Urea, mg/dl, median (range)	39 (28–73.5)
Sodium, mEq/L, mean ± SD	138 ± 4.3
Potassium, mEq/L, mean ± SD	4.27 ± 0.67
RFH-NPT, *n* (%)	
Low risk	4 (4.3)
Moderate risk	12 (12.8)
High risk	78 (83)
BMI, kg/m^2, mean ± SD	26.08 ± 4.51
BMI	
Malnutrition, *n* (%)	9 (9.6%)
SGA, *n* (%)	
A	24 (25.5)
B	52 (55.3)
C	18 (19.1)

Note: Categorical variables data were expressed as absolute frequency (*n*) and relative frequency (%), and quantitative variables are expressed as mean and SD (mean ± SD) or median and interquartile ranges (25th–75th percentile).

Abbreviations: ALP, alkaline phosphatase; ALT, alanine aminotransferase; AST, aspartate aminotransferase; BMI, body mass index; GGT, gamma-glutamyl transferase; HCC, hepatocellular carcinoma; MELD, Model for End-Stage Liver Disease; RFH-NPT, Royal Free Hospital-Nutritional Prioritizing Tool; SGA, subjective global assessment.

included in the final analysis, with a mean age of 60.29 ± 9.33 years. Of these, 64.9% ($n = 61$) were men and the majority of the participants were Caucasians (83%, $n = 78$). The main etiology of cirrhosis was hepatitis C (27.6%, $n = 26$), followed by chronic alcohol consumption (25.5%, $n = 24$), hepatitis C plus chronic alcohol consumption (16%, $n = 15$), nonalcoholic steatohepatitis (NASH) (16%, $n = 15$), and NASH plus chronic alcohol consumption (2.1%, $n = 2$). Other causes of cirrhosis (12.8%, $n = 12$) included: primary biliary cholangitis, hemochromatosis, autoimmune hepatitis, and cryptogenic cirrhosis. Ascites was the most common complication, with a prevalence of 72.3% ($n = 68$), of which 62.3% ($n = 43$) were moderate or severe grades. Upon physical exam, 50% ($n = 47$) of patients had some degree of lower limb edema. The median hospital stay was 11.5 days (IQR: 8–18). Table 1 presented the clinical, demographic, and nutritional characteristics of these patients.

Nutrition screening and assessment

Seventy-eight (83%) of the patients were classified as high nutritional risk according to the RFH-NPT. The prevalence of malnutrition was 74.5% ($n = 70$) according to the subjective global assessment (SGA). On the other hand, the frequency of malnutrition was lower considering the BMI (9.6%, $n = 9$), an anthropometric measure that almost exclusively involves body weight (Table 1). There was no statistically significant difference between nutrition status and food intake according to the DR method, being that patients with SGA-A classification consumed a mean of 1376.30 ± 545.40 kcal/day, SGA-B classification consumed a mean of 1263.16 ± 528.77 kcal/day, and SGA-C classification consumed a mean of 1249.35 ± 406.93 kcal/day ($P > 0.05$). There was also no statistically significant difference between nutrition status and FIVS categories (between the four categories and the dichotomized categories [food intake responses as "a quarter" or "nothing," representing

<50%, and "half" or "about all," representing ≥50% meal intake], $P > 0.05$), as well as there was no statistically significant difference with the etiology of cirrhosis, the severity of liver disease, and presence of complications ($P > 0.05$).

Food intake assessment—nutrition prescription and DR

The patients consumed a mean of 1289.41 ± 509.72 kcal/day (18.61 ± 7.94 kcal/kg/day) from the five main meals provided by the hospital, while the mean nutrition prescription was 2191.25 ± 295.78 kcal/day (31.25 ± 7.70 kcal/kg/day). The breakfast represented 21.43% (15.97–27.19) of the food intake of the day; lunch represented 24.14% (14.32–28.74); and dinner 23.55% (14.98–29.98). Other meals (afternoon snack and late evening snack) totaled 30.88% of the food intake of the day. Therefore, the majority of patients (96.8%, $n = 91$) had lower mean energy intake than the nutrition prescription, as illustrated in Figure 2. In addition, the Bland–Altman plot illustrates the differences between mean daily energy intake and nutrition prescription, with a difference of −901.84 kcal/day and a 95% limit of agreement ranging from −1831.01 to 27.33 kcal/day (Figure 3). There was a statistically significant difference between mean daily macronutrient intake and nutrition prescription being that 92 (97.8%) of patients had lower protein intake than the nutrition prescription (Table 2). Although most patients had an inadequate dietary intake, the proportion of daily macronutrients remained within the nutrition recommendations: total carbohydrates (55.33 ± 6.35%), total lipids (28.90 ± 5.68%), and protein (15.77 ± 3.05%).

As for the types of diet prescribed, 7.4% ($n = 7$) had a prescription for a diet with a modified texture, 17% ($n = 16$) had a regular standard diet, and 75.5% ($n = 71$) had a prescription for other dietary patterns. The other dietary patterns than the regular most frequently prescribed were severely restricted sodium diet (food prepared without additional salt, containing approximately 1200 mg of intrinsic sodium per day, being able to have a 1–2 g of additional salt or not with the meal—lunch and dinner, according to the diet prescription) (25.5%, $n = 24$), and diabetes diet (no sugar and whole foods) (22.3%, $n = 21$). Patients who received a regular standard diet, other dietary patterns, and diet with modified texture consumed a mean of 1574.26 ± 162.53,

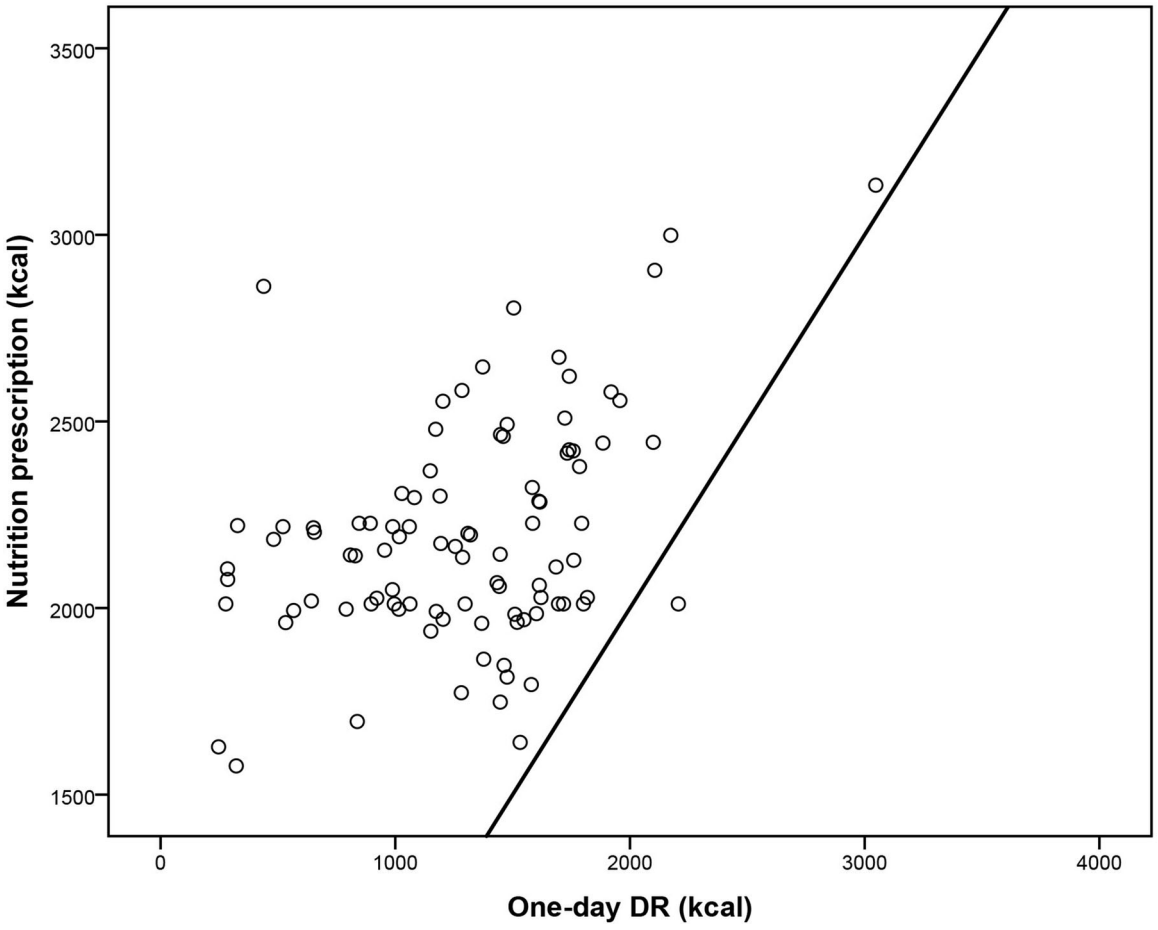

FIGURE 2 Dispersion plot of the mean daily energy intake using diet record (DR) method and the nutrition prescription

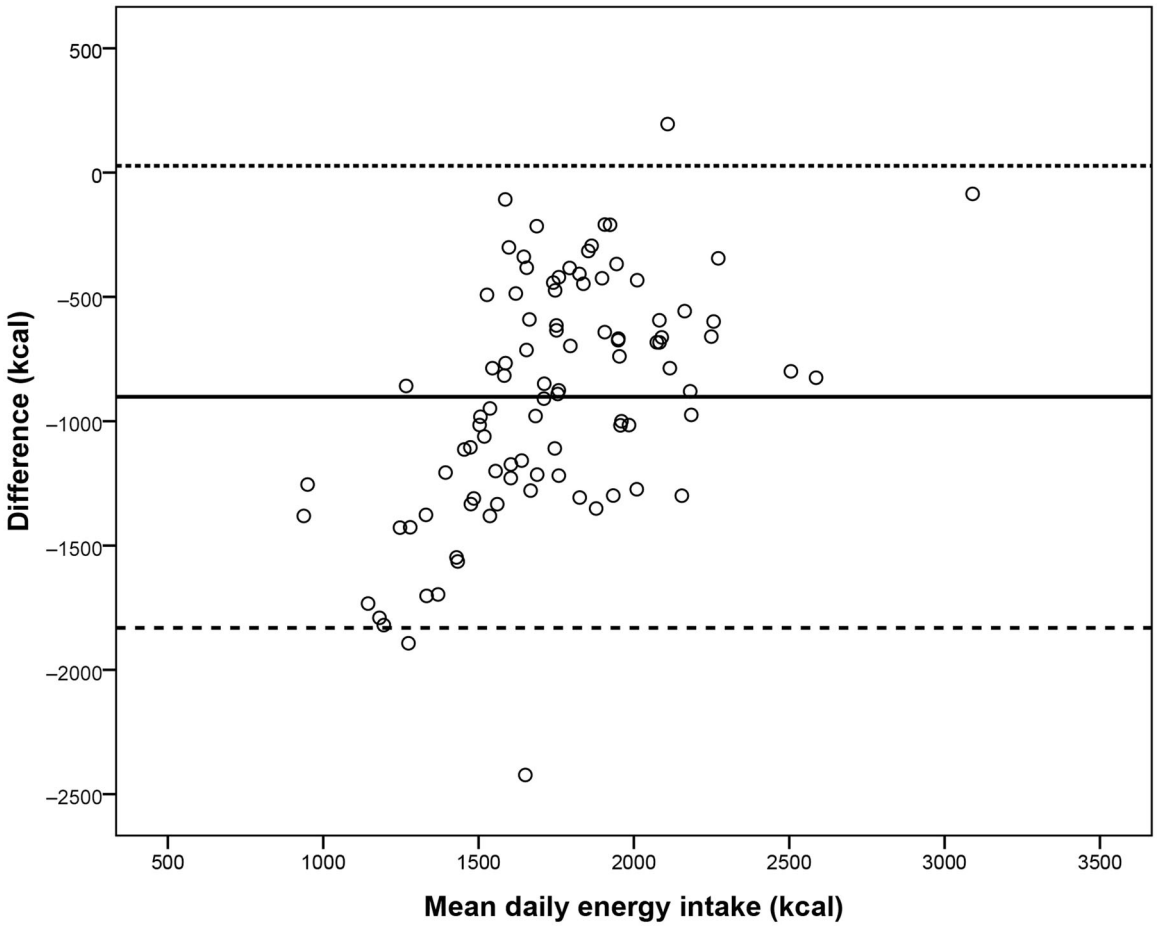

FIGURE 3 Bland–Altman analysis of the differences between the mean daily energy intake using the diet record method compared with the nutrition prescription. The solid line represents the mean value of the difference between the energy of the food intake and nutrition prescription. Dotted lines represent each limit of agreement

TABLE 2 The difference in nutrition prescription and mean daily energy and macronutrient intake using diet record method ($n = 94$)

Unit of measure	Nutrition prescription, mean ± SD	Dietary intake, mean ± SD	Difference, mean ± SD	*P*-value
kcal/day	2191.25 ± 295.78	1289.41 ± 509.72	−901.84 ± 474.07	<0.001
kcal/kg/day	31.25 ± 7.70	18.61 ± 7.94	−12.64 ± 7.65	<0.001
Protein, g	100.76 ± 17.13	50.80 ± 21.42	−49.96 ± 20.43	<0.001
Protein, g/kg/day	1.44 ± 0.38	0.73 ± 0.34	−0.70 ± 0.35	<0.001
Carbohydrate, g	297.47 ± 42.41	179.50 ± 71.96	−117.97 ± 74.54	<0.001
Lipid, g	66.66 ± 12.93	42.32 ± 17.51	−24.33 ± 17.65	<0.001

Note: Quantitative variables are expressed as mean and SD (mean ± SD) and were compared with paired Student *t*-test. $P < 0.05$ were considered statistically significant.

1253.93 ± 50.34, and 998.13 ± 278.01 kcal/day, respectively. Patients with a diet with modified texture had lower mean daily energy intake compared with patients who received a regular standard diet ($P = 0.035$). Regarding oral nutrition supplements (ONS), 2% ($n = 2$) of patients had a prescription on the day of assessment.

Food intake assessment—FIVS

According to the patients' classification, 52.1% ($n = 49$) ate "about all," 17% ($n = 16$) ate "half," 26.6% ($n = 25$) ate "a quarter," and 4.3% ($n = 4$) ate "nothing" at lunch. Regarding patient and researcher responses, there was

disagreement for three answers in the "about all" category, two in the "half" category, and three in the "a quarter" category. Of these, five patients overestimated their intake. There was a strong agreement between patient and researcher responses on the FIVS ($k = 0.869$, $P < 0.001$).

TABLE 3 Reasons for reduced meal consumption ($n = 94$)

Reasons	*N* (%)
"I was not hungry at the time"	22 (23.4)
"I do not have my usual appetite"	11 (11.7)
"I did not like the smell/taste of the food"	8 (8.5)
"I did not like the type of food offered"	4 (4.3)
"I had nausea/vomiting"	4 (4.3)
"I normally eat less than what was served"	2 (2.1)
"I was too tired"	2 (2.1)

Note: Reduced food intake was defined as consuming "a quarter" or "nothing" of the meal.

Of the patients eating "a quarter" or "nothing" at lunch, the most frequent reason was "I was not hungry at the time," reported by 23.4% ($n = 22$) of the patients. The other most frequently stated reasons for not completing the meal are presented in Table 3. Of the patients eating "nothing" at lunch, the stated reasons for not completing the meal were "I was not hungry at the time," "I do not have my usual appetite," and "I had nausea/vomiting." Of the 29 patients who ate "a quarter" or "nothing," 34.5% ($n = 10$) had one reason to reduce food intake, 41.4% ($n = 12$) had two reasons, 20.7% ($n = 6$) had three reasons, and 3.4% ($n = 1$) had four reasons.

Association between DR and FIVS

A statistically significant association was found between the two assessment methods: patients with lower food intake according to the FIVS categories also had lower mean energy and macronutrient intake according to the DR, as

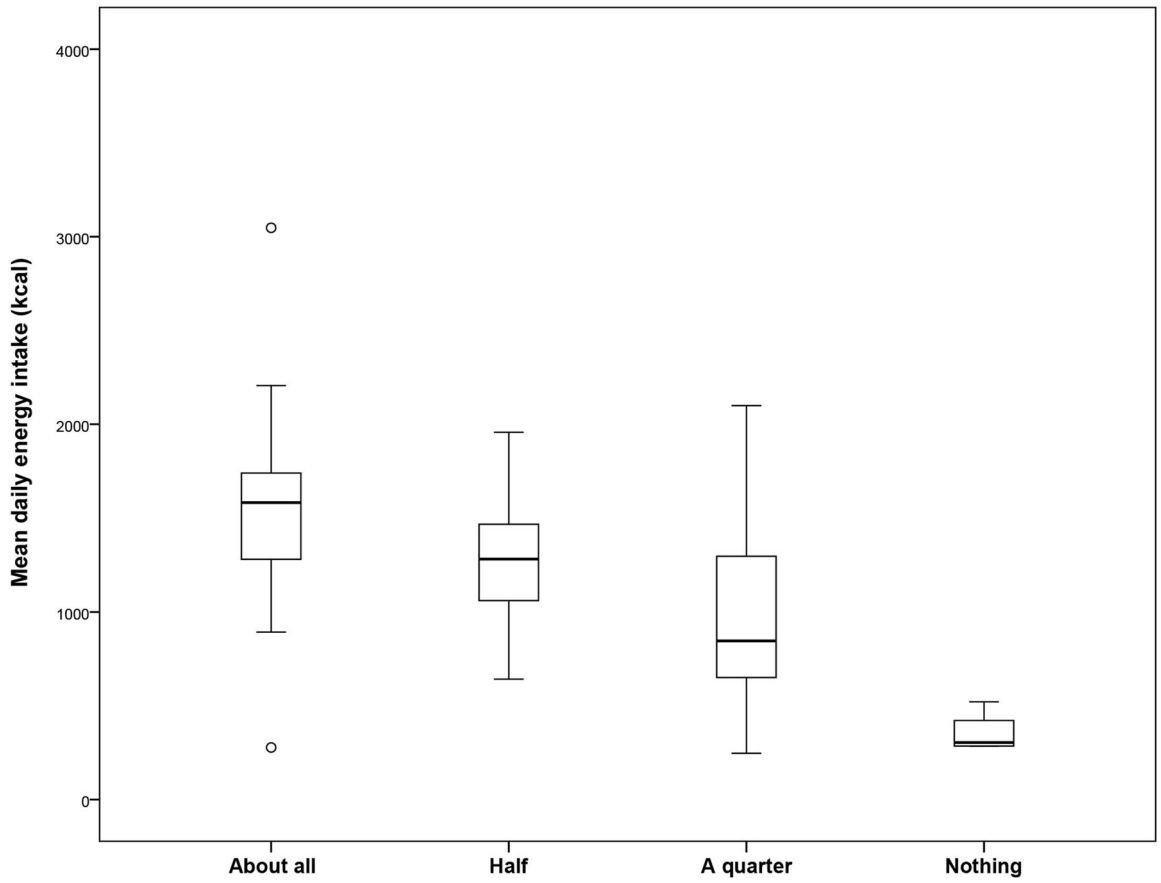

FIGURE 4 Boxplot chart of mean daily energy intake using the diet record method according to Food Intake Visual Scale categories. There were no statistically significant differences in the "about all" and "half" categories ($P = 0.262$), as well as "half" and "a quarter" categories ($P = 0.149$). There were statistically significant differences in "a quarter" and "nothing" categories ($P = 0.038$), "about all" and "a quarter" categories ($P < 0.001$), and "nothing" with "about all" and "half" categories ($P < 0.001$). Analysis of variance test with Bonferroni multiple comparison analysis

TABLE 4 Mean daily energy and macronutrient intake using diet record method according to the Food Intake Visual Scale categories ($n = 94$)

Unit of measure	About all, $n = 49$, mean ± SD	Half, $n = 16$, mean ± SD	A quarter, $n = 25$, mean ± SD	Nothing, $n = 4$, mean ± SD
kcal/day	1526.58 ± 428.27	1282.08 ± 302.83	978.96 ± 468.81	353.59 ± 113.16
kcal/kg/day	21.28 ± 6.37	19.52 ± 5.68	15.01 ± 9.03	4.65 ± 0.96
Protein, g	61.72 ± 17.80	48.46 ± 14.59	37.40 ± 17.30	10.01 ± 1.47
Protein, g/kg/day	0.86 ± 0.37	0.73 ± 0.26	0.57 ± 0.34	0.13 ± 0.02
Carbohydrate, g	212.64 ± 60.63	179.36 ± 49.94	137.07 ± 69.55	42.82 ± 13.55
Lipid, g	48.78 ± 16.70	42.62 ± 9.59	32.72 ± 17.04	16.00 ± 6.47

Note: Quantitative variables are expressed as mean and SD (mean ± SD) and were compared with analysis of variance test with Bonferroni multiple comparison analysis.

demonstrated in Figure 4 and Table 4. To verify whether lunch was representative of the entire day's intake, a correlation was performed between lunch calorie intake and total daily calorie intake. The mean lunch calorie intake was 309.27 ± 169.41 kcal/day, whereas in the full-day DR, it was 1289.41 ± 509.72 kcal/day. There was a strong positive correlation between lunch calorie intake and total daily calorie intake ($r = 0.719$, $P < 0.001$) (Figure 5).

DISCUSSION

This study investigated the food intake of hospitalized patients with decompensated cirrhosis. Our study demonstrates that patients with decompensated cirrhosis had an insufficient dietary intake, much lower than the nutrition prescription. What was additionally demonstrated through the FIVS was that almost half of the sample indicated eating half or less of the evaluated meal, and the most frequent reason for eating a quarter or none of the meal was due to not being hungry at the time.

The difference between the prescribed nutrition and patient food intake is relevant because such patients are not reaching caloric and protein goals, which could contribute to malnutrition and a worse prognosis.[4,5] In this sense, the mean protein intake in our sample was 0.73 g/kg/day, much lower than the protein recommendations in cirrhosis. Despite this fact, the proportion of daily macronutrients remained within the nutrition recommendations, which shows us that the intake was lower as a whole, and not only for specific items. Ney et al.[4] reported that insufficient protein intake (<0.8 g/kg/day) was prevalent and independently associated with malnutrition and mortality in patients with cirrhosis awaiting liver transplantation. The authors highlighted, unlike many other prognostic factors, protein intake is potentially modifiable. In this sense, investigating the difficulties that affect food consumption can help to elucidate the problem of reduced intake. These data can be easily obtained through the FIVS because the instrument asks patients why they ate less than half of the meal. Similar to the present study, other studies with hospitalized patients also found that the main reason for eating a quarter or none of a meal was because the patients were not hungry at the time.[26,27]

In the present study, 52.1% of patients ate their entire meal, and the prevalence was higher than that observed in other studies performed in different regions. Results from ND in the 245 US hospitals showed that 36.5% of patients from different specialties ate their entire meal.[28] Kontogianni et al evaluated data from 113.930 adult patients (from 4519 units, 1358 hospitals, 54 countries) and showed that only 41.6% of patients reported having consumed all their served meal.[27] However, considering

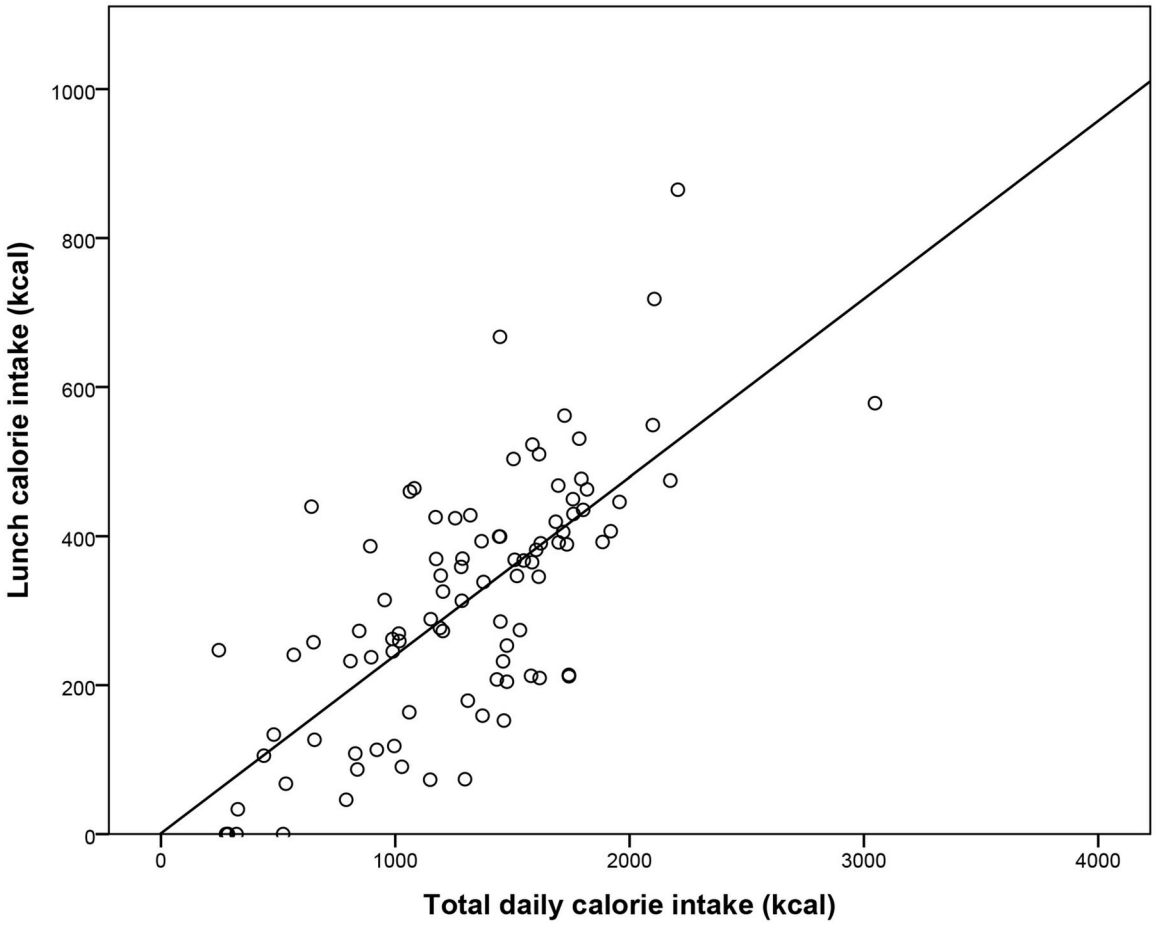

FIGURE 5 Correlation between lunch calorie intake and total daily calorie intake using diet record method ($r = 0.719$, $P < 0.001$)

only the South American patients' data, 48% ate their entire meal, similar to observed in the present study.[29]

The causes of insufficient dietary intake are likely to be multifactorial, and the patients may be afflicted with one or all of these etiological factors. Considering the reduced food intake, prescription of unpalatable diets (eg, a low-sodium diet) has a negative impact on intake as it negatively affects the acceptance and palatability of the diet. In addition to the etiological factors already mentioned, it is also important to highlight that patients are admitted to the hospital because they are with severe liver disease. Sickness itself reduces appetite, the ability to digest and absorb food, and influences the metabolic utilization of food.[30] It must be emphasized that disease severity can also impair the assessment of food intake through methods that require broad patient participation in assessing food intake, such as instruments involving the DR or a 24-h recall.

Although these are widely used methods, they require a long time to obtain the data, up to 3 days for DRs, plus the time needed to transfer it to software and perform the energy and macronutrient calculations. Furthermore, the reliability and quality of the data may not be as good because it depends on the patient's memory and collaboration.[12] On the other hand, the FIVS has the advantage of quick application and data collection, expediting dietary intake evaluation in the hospital setting.

The FIVS was used to evaluate lunch because it is normally the main meal of the day in the evaluated country and there is consensus about its importance due to the considerable energy supply it provides. Moreover, in a multivariate analysis in the ND study,[26] essentially the same results were obtained when lunch food intake was replaced by breakfast or dinner intake. The food intake at a single meal was used as an indicator of total intake because the effect on outcome was similar in all three meals, and there was a significant positive correlation with overall food intake.

In the present study, we did not observe an association between the presence of malnutrition risk or malnutrition and dietary intake. On the other hand, Sharma et al[31] reported that well-nourished patients (SGA-A) consumed significantly more calories than malnourished patients (SGA-B and SGA-C) in a sample of 251 outpatients with cirrhosis. However, it is important to underscore the fact that we evaluated hospitalized patients with severe liver disease associated with several complications that may have

contributed to the patients having an inadequate dietary intake in general, independently from nutrition status.

Regarding complications, it should be noted that for patients with high-grade HE, the FIVS might be unreliable due to the patient's condition. This study included only patients with initial grades (I and II) of HE, that is, who had the neurological capacity to answer the questions. These patients were included because HE is one of the main and most prevalent complications of decompensated cirrhosis and these patients should also be evaluated. In addition, there was excellent agreement between patient and evaluator responses, even when patients with HE were included.

Concerning the low use of ONS on the day of evaluation, this fact can be explained due to data were collected within 72 h of hospital admission, an observation period of food intake. However, if the energy and/or protein of a regular diet are not enough, they should be supplemented with ONS when appropriate because ONS are ideally suited to provide high-quality nutrition when diet alone is insufficient to meet nutrition needs.[32] In our opinion, including ONS between larger meals would be the best strategy, especially at night, after dinner. However, for patients who do not tolerate lunch and dinner, the ONS could be used as a meal replacement until appetite is restored.

As for the strengths of the study, we highlight the adaptation of a practical, easy-to-implement, low-cost instrument for use in patients with cirrhosis in a hospital setting, a population that is often overlooked. Furthermore, to our knowledge, our study was the first to use a visual scale to assess the food intake in these patients. This instrument could be an effective alternative to currently used methods. Another strength is that local food data and composition tables were used to calculate DR, thus approximating more realistic intake estimates. In addition, the same-trained researcher performed all nutrition assessment tools, and self-reported measures were not needed. Nevertheless, some limitations remain. First, although we did not use food weighing, which is considered the criterion standard method, all meals served had standardized portioning. Weighing all the foods served to patients is not feasible in the clinical practice of a large hospital, as was our case. Second, food intake data were obtained for only a short period due to the patient's illness severity and for not always having the assistance of caregivers. Furthermore, many had fasted for some time for exams, which impeded data collection. Therefore, it was possible to perform only 1-day DR. Third, the FIVS only assesses the amount consumed and not the quality of the meal. If the goal is to identify reduced intake, and to assess the quality, other methods should be used for a more detailed evaluation.

In conclusion, the results of this study demonstrate that FIVS can be implemented in clinical practice to measure food intake in patients with decompensated cirrhosis as a substitute for the DR because it is a noninvasive, low-cost, quick, and easy bedside method for obtaining data. Hospitalized patients with decompensated cirrhosis are profoundly affected by reduced food intake. They present a significant caloric and protein deficit, which contributes to a worsening nutrition status and disease progression. Thus, we suggest individualized nutrition assessment and early intervention with ONS for nutrition support of hospitalized patients with decompensated cirrhosis.

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CONFLICT OF INTERESTS

None declared.

AUTHOR CONTRIBUTIONS

Camila Saueressig and Valesca Dall'Alba equally contributed to conception/design of the research; Camila Saueressig, Pâmela Kremer Ferreira, and Joana Hoch Glasenapp contributed to acquisition, analysis, or interpretation of the data. All authors drafted the manuscript, critically revised the manuscript, agree to be fully accountable for ensuring the integrity and accuracy of the work, and read and approved the final manuscript.

ORCID

Camila Saueressig http://orcid.org/0000-0002-9907-0097
Pâmela Kremer Ferreira http://orcid.org/0000-0001-5939-3943
Joana Hoch Glasenapp http://orcid.org/0000-0003-1659-0079
Valesca Dall'Alba http://orcid.org/0000-0002-8896-3199

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SUPPORTING INFORMATION

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